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ABSTRACT

This report explores the bodies of literature pertinent to the economics of information, a topic of growing interest to the information community and to economists. As used here, economics of information refers to the concepts and tools of economics as they apply to information activities. The report consists of (1) a short section on the economists' framework for analysis, (2) a table that divides the pertinent literature into 14 categories, briefly defines each category, and explains why it is important to information activities, (3) a brief commentary on the state of this literature and (4) a selected bibliography of over 300 items. An exhaustive list of all items could not be done in this initial effort, but, most recent literature, especially monographs, technical reports and literature surveys, is covered to the extent that a reader should get a good introduction to this literature. In addition, 25 items are identified as giving particularly informative overviews. These items represent the full range of material from theoretical studies to applied analyses, plus several surveys. (Author)

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THE ECONOMICS OF INFORMATION:

BIBLIOGRAPHY AND COMMENTARY ON THE LITERATURE

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PREFACE

This brief and long-awaited introduction to the literature of the economics of information is the first of a modest number of publications in the area to be sponsored by the Special Interest Group (SIG) on Cost, Budgeting & Economics of the American Society for Information Science (ASIS). The report is the result of a cooperative endeavor with the ERIC Clearinghouse on Library and Information Sciences (ERIC/CLIS), a contractual responsibility of ASIS.

Today—1971—there is no single other subject in the area of information which transcends costs in importance. Decision makers, budget analysts and perhaps soon, the public, are examining our operating costs with a penetrating and often skeptical eye. It is patent that while methodology to optimize the operation of information dispensing organizations must be constantly developed, it is equally clear that methodology and standards for finding, analyzing, reporting costs, both in their dollar and their benefit sense, must be produced.

There is tragedy in the fact that there exists ten times the literature on the economics of information listed herein, unpublished, squirreled away in file cabinets over this country—rough analyses, intensive studies. These have not been published because they are either in rough form or are proprietary. As Acting Chairman of this SIG, I appeal to all users of this document to submit works of this nature—cleaned up or rendered non-proprietary if necessary, to ERIC/CLIS for announcement and availability purposes. The information community needs all the help in this area it can get.

Finally, I ask all readers to get behind the drive to make this SIG effective. Librarians and information scientists with deep interest in the area of costs, budgeting and economics should be persuaded to join our common effort.

Erik Bromberg, Director of Libraries
U.S. Department of the Interior
Washington, D.C. 20240
Acting Chairman, Special Interest Group
on Costs, Budgeting & Economics,
American Society for Information Science

THE ECONOMICS OF INFORMATION: BIBLIOGRAPHY AND COMMENTARY ON THE LITERATURE

Abstract

This report explores the bodies of literature pertinent to the economics of information, a topic of growing interest to the information community and to economists. As used here, economics of information refers to the concepts and tools of economics as they apply to information activities. The report consists of (1) a short section on the economists' framework for analysis, (2) a table that divides the pertinent literature into 14 categories, briefly defines each category, and explains why it is important to information activities, (3) a brief commentary on the state of this literature and (4) a selected bibliography of over 300 items. An exhaustive list of all items could not be done in this initial effort, but, most recent literature, especially monographs, technical reports and literature surveys, is covered to the extent that a reader should get a good introduction to this literature. In addition, 25 items are identified as giving particularly informative overviews. These items represent the full range of material from theoretical studies to applied analyses, plus several surveys.

CONTENTS

Purpose 1

Procedure 1

Figure 1—The Economists' Framework for Analysis 3

Table 1—Literature Categories Pertinent to the Economics of Information . . . 5

Commentary on the State of the Literature 8

Bibliography 11

THE ECONOMICS OF INFORMATION:
BIBLIOGRAPHY AND COMMENTARY ON THE LITERATURE

Purpose

The purpose of this bibliographic exercise is to clarify the range of literature pertaining to the economics of information. The two major goals are to detail the core literature on the economics of information, and to survey the peripheral literature surrounding this core, or, perhaps more accurately, the material from which this core is emerging.

This purpose implies a particular focus. First, commentary is directed at the literature on the economics of information, not at substantive issues in the economics of information, which will be a topic for analysis in a later paper. Second, because of its exploratory nature, this bibliographic exercise takes a broad view of the economics of information and includes a wide range of material for readers with a variety of backgrounds and interests. While the bibliography aims to be comprehensive (surveying the pertinent literature from both the economics and the information communities), it is not exhaustive. Items older than three years are included only if they report significant work for which no more recent effort substitutes. The bibliography concentrates on monographs and technical reports, particularly in the economics literature. Foreign language items are omitted, although substantive work is contained in them.

As a result, the bibliography should provide a working reference checklist to the relevant literature on the economics of information.

Procedure

In compiling this bibliography, two basic problems were encountered. Within the enormously broad field of "economics:" Which kinds of studies were likely to produce literature most pertinent to the economics of information? And when specific useful pieces of literature had been pinpointed, how could they best be classified to suit the purposes of prospective users?

The first step in generating this bibliography was to specify the factors involved in economic analysis of information activity Figure 1—**The Economists' Framework for Analysis** is a schema which serves as the criterion for identifying the bodies of literature to be covered in the bibliography. Since this schema is the heart of this exercise, some brief discussion may be warranted to clarify the factors outlined in the schema and to develop the overall character of economic analysis. Basically, economic analysis is the study of choice: the allocation of scarce resources among alternative uses, and the distribution of outputs among alternative users—that is, the classic questions of what and how much to produce, and who gets what products. Economic analysis finds answers to these questions by balancing supply against demand. Figure 1 reflects this equilibration, using some of the technical language and concepts economists employ when addressing these questions. In general, their analysis evaluates the conduct and performance of the decision-making units around which economic activity is organized, and the relationships among these decision-making units.

The supply side of the balance (upper left box) represents the production function—the type and amount of resource inputs producers need for a given kind and quantity of output; in our economy, this production function is transformed into a statement of dollar costs required to produce a given output. The demand side of the balance (upper right box) represents a utility function—the type and amount of outputs consumers prefer; the utility function can be viewed as a statement of the benefits consumers derive from these outputs.

The fulcrum of the balance of the mechanism for adjusting supply to demand (center box) includes two basic decision-making modes: (1) the market system mode which matches supply to demand via price signals from market transactions, and informs producers of the relative demand for an output and tells consumers about the relative cost of the output, and (2) the non-market decision process mode, which matches supply to demand via some authority which establishes production levels and determines which consumers receive the output. In most economies, a combination of these two decision-making modes is used, with the actual mix depending, in part, on the political preferences of the society and the economic characteristics of the output involved.

The adjustment mechanism produces decisions of two general types: (1) decisions about the allocation of resources (lower left box), usually summarized in budgets for producers, and (2) decisions about the distribution of outputs to consumers (lower right box), typically contained in service policies concerning these outputs, or, more indirectly, through social policies which determine income distribution.

This exposition of the concepts used for economic analysis is over-simplified; it neglects the complex issues involved in applying these concepts to real world activities and makes a number of assumptions as to

the nature of man and society. Yet the schema does characterize the overall framework in which most economic analysis is done today.

Although economists devote most of their effort, to the factors listed in the five inner boxes just described, economic analysis itself is contained within a larger social and environmental framework. Thus, economists join with researchers in other disciplines in studying this larger framework—with engineers in analyzing the technological determinants of production function activity (the outer left box), and with sociologists, psychologists, and political scientists in examining the social aspects of economic activity such as incentives, value structures, organizational and group behavior, the socialization process, etc. (the outer right box).

Certain other conventional distinctions imbedded in economic literature were used in this literature search:

1. The level of activity studied, ranging from micro-economic theory (which examines the behavior of individuals and organizations) to macro-economic theory (which examines the behavior of an entire economy and its major sectors in terms of aggregate measures). The analysis of particular industries, such as the information industry, is located in between these two extremes.
2. The type of activity studied, grossly dichotomized into the study of public sector activity (the production and distribution of public goods, public finance, welfare economics, etc.) and private sector activity (the production and distribution of private goods, theory of the firm, equilibrium conditions of individual markets, etc.).
3. The character of the models used, generally split into two major categories, the first being comparative static models which analyze economic activity in terms of a sequence of equilibrium points (akin to a series of snapshots over time), and the second being dynamic models which analyze economic activity in terms of a continuous line tracing the movement of particular economic indicators (akin to a motion picture).
4. The purpose to be served by the analysis, ranging from highly abstract but very general analysis, aimed primarily at advancing the state of economic knowledge underpinning policy formulation, to highly applied but often narrow analyses, aimed primarily at solving some specific issue or decision problem.

The second major step in generating this bibliography was to review the recent literature from both the economics and the information communities in order to identify the major bodies of literature which report on the economics of information. In general, these two communities produce quite different types of literature pertinent to this topic. The economics literature consists primarily of items which develop the concepts and tools and contains for analysis only a few studies directly focused on the economics of information. The information literature consists primarily of items describing structural factors (decision-making units and their relationships) in information activity and provides some data on substantive aspects, although usually in a hortative mode.

Based on the schema shown in Figure 1, the four classifications listed above, and the review of literature, the resultant material was categorized as shown in Table 1. Categories 1 to 9 are concerned with literature in the economics community; items 10 to 14 with that in the information community. A description of the material covered and its pertinence to the economics of information is given for each category.

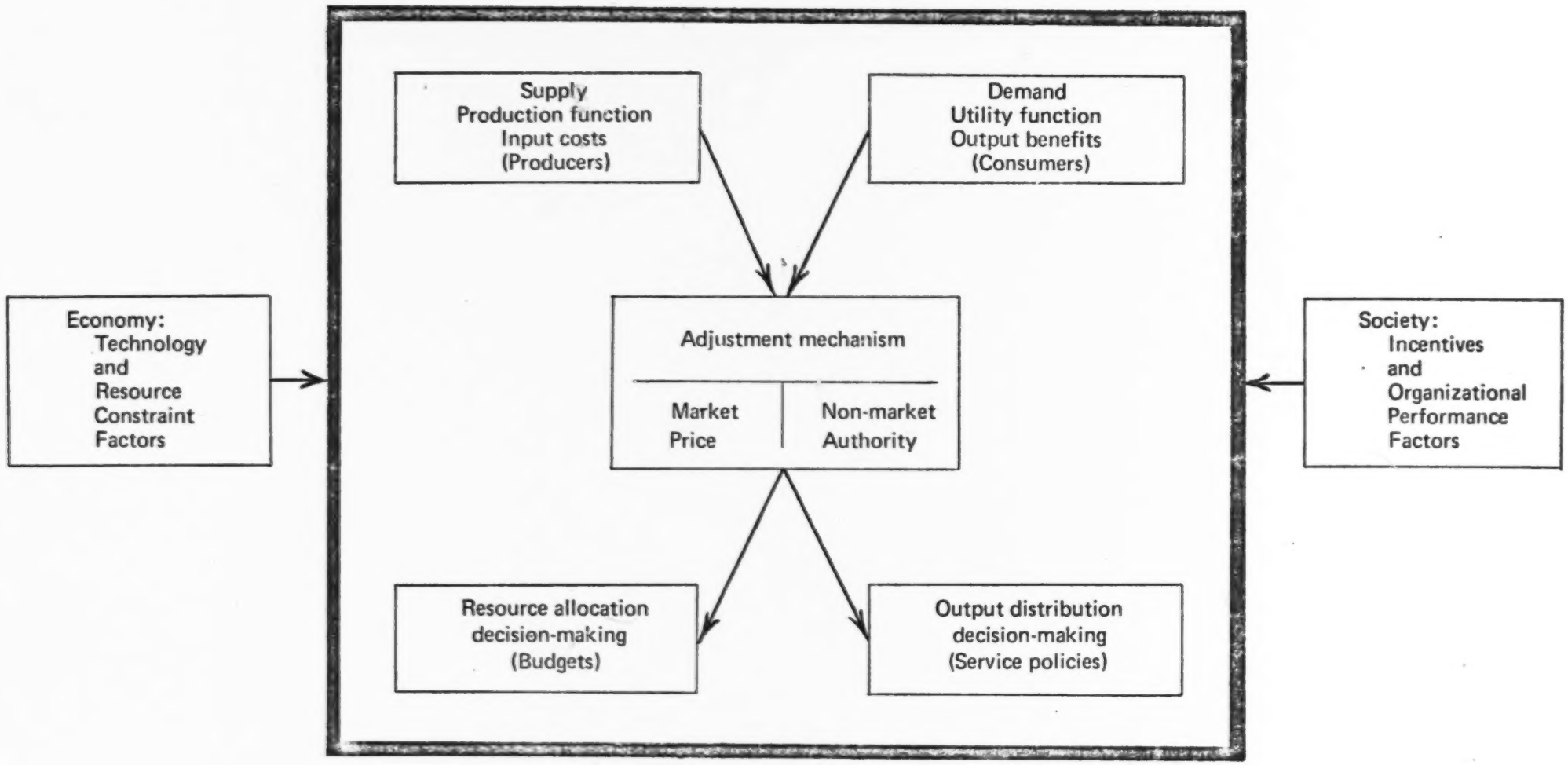

FIGURE 1
The Economists' Framework for Analysis:
A schema characterizing the overall framework of economic analysis

TABLE 1. CATEGORIES OF LITERATURE PERTINENT TO THE ECONOMICS OF INFORMATION

1. ECONOMICS: OVERVIEW/THEORY

   Description. Describes the major concepts and tools of economic analysis and the problems addressed by economists.

   Pertinence. Provides a general means for analyzing economic aspects of information activity.

2. ECONOMICS: INDUSTRY ANALYSIS/PRODUCTION FUNCTION/MANPOWER

   Description. Analyzes the market relationship between producers and consumers of some good or service in terms of industry structure, conduct, and performance. Considers major input factors such as labor, equipment, etc., used in producing the industry output.

   Pertinence. Using information as the resource or commodity, provides a means for analyzing the effectiveness of alternative organization patterns in the information industry and the impact of various policy choices upon the operations of the industry. Analyzes the relationship between information supply and demand factors plus the adjustment mechanisms in terms of effects on resource allocation and output distribution.

3. ECONOMICS: PUBLIC SECTOR/PUBLIC GOODS/WELFARE/BENEFIT-COST/PPBS/ NON-MARKET DECISION MAKING/ECONOMIC ORGANIZATION

   Description. Analyzes the non-market aspects of industry and government activity particularly as they relate to public goods production and consumption. Considers alternative organizational configurations for performing economic activity.

   Pertinence. Assuming much information activity entails non-market decision making and public good factors, provides a means of analyzing such factors as they affect information activity. Includes both macro- and microanalysis of alternatives in generating input resources to sustain information activity, allocating such resources to various information functions, and distributing the outputs of such functions to various consumer groups.

4. ECONOMICS: OPERATIONS ANALYSIS/O.R./CAPITAL BUDGET THEORY/MANAGEMENT ECONOMICS/SYSTEM ANALYSIS/MARKETING/COST ESTIMATION

   Description. Describes the procedures for identifying components of economic activity, and develops the observational measures for analyzing such activity in terms of supply cost factors and demand benefit factors.

   Pertinence. Provides the specific means for identifying and measuring economic aspects of information activity. Focuses primarily on microanalysis in developing and managing the operations of an information system.

5. ECONOMICS AND ALLIED SCIENCES: SECTOR STUDIES CLOSELY RELATED TO INFORMATION ACTIVITY

   Description. Applies economic analysis to sectors of activity similar to or directly related to information activity.

   Pertinence. Provides useful examples of the employment of economic analysis in areas similar to information activities. Also provides significant data on major information producer and consumer groups.

6. ECONOMICS AND ALLIED SCIENCES: INNOVATION/THE ENTREPRENEUR/INCENTIVES

   Description. Studies phenomena related to economic activity which refines key assumptions made in economic analysis, particulary factors underlying the presumed goals of economic activity and changes in economic organization.

Pertinence. Such studies often identify information as a critical variable in innovation and performance incentives. Potentially such studies can clarify the process of innovation and performance incentives in information activity.

7. ECONOMICS AND ALLIED SCIENCES: POLICY ANALYSIS/PLANNING

Description. Studies the policy-making process and system, particularly in government.

Pertinence. Such studies often identify information as a critical variable in the policy-making process. Such studies can also clarify the process formulation concerning information activity.

8. ECONOMICS AND ALLIED SCIENCES: FORECASTING AND PERFORMANCE INDICATORS/ KNOWLEDGE UTILIZATION/TECHNOLOGY ASSESSMENT

Description. Studies the determination and prediction of social and economic trends, and the role of knowledge in such activity.

Pertinence. Such studies view information and information activity as essential components in trend analysis and in the organization of effort to produce forecasts.

9. ECONOMICS AND ALLIED SCIENCES: SOCIOLOGY OF KNOWLEDGE/SOCIOLOGICAL ANALYSIS/HISTORY/ORGANIZATION THEORY/SOCIAL PSYCHOLOGY

Description. Studies knowledge and information behavior as an aspect of society, particularly as a factor in organizational activity.

Pertinence. Such studies take information and knowledge as their primary topic, though usually at a very general level. Provides a broad view of information activity to serve as a context for performing economic analysis of information activity.

10. INFORMATION: OVERVIEW/DOCUMENTATION/ADMINISTRATION/INFORMATION SCIENCE AND LIBRARY RESEARCH/NATIONAL SYSTEM–INDUSTRY–POLICY STUDIES/COPYRIGHT

Description. Describes the major components performing information activity, their interrelationship, and their general practices and policies.

Pertinence. Details the general framework structuring information activity, thus identifying major decision-making units and their relationship. Provides some data concerning the adjustment mechanisms relating supply and demand plus allocating resources and distributing outputs.

11. INFORMATION: SURVEYS/USER STUDIES

Description. Analyzes the communities and groups which consume or generate information.

Pertinence. Provides some data concerning information demand factors and benefits.

12. INFORMATION: SYSTEM EVALUATION/ANALYSIS/GENERAL MANAGEMENT STUDIES

Description. Describes the operating characteristics of information activities usually in terms of some performance measures.

Pertinence. Provides some data concerning supply factors and costs in information production functions.

13. INFORMATION: SYSTEM DEVELOPMENT/PLANNING/AUTOMATION

Description. Explores the employment of modern information processing technology to information activity.

Pertinence. Provides a dynamic aspect to information production functions through shifts in technology and resource factors plus changes in incentives and organizational performance factors.

14. INFORMATION: SYSTEM OPERATIONS/OPERATIONAL ANALYSIS

Description. Details the current operations and policies of information activities.

Pertinence. Provides some data concerning resource allocation and output distribution by information activities.

The final step in generating the bibliography was to select from these bodies of literature the citations which are useful in studying the economics of information. A citation was selected for inclusion in the bibliography if it was pertinent to the economics of information, was broad in scope (i.e., it linked together factors outlined in Figure 1), and had been published recently (most items are dated no earlier than 1968).

The major abstracting and indexing tools which cover both economics and information literature were consulted for relevant citations. In addition, the 1968-1970 issues of leading journals in the information field were scanned for pertinent citations.

Roughly 300 citations which fit the stated criteria were located and are listed in the Bibliography under one of the 14 categories described in Table 1. For the convenience of readers who want a condensed introduction to the economics of information, the most informative citations are identified by an asterisk (*).

Commentary on the State of the Literature

Although this study was aimed primarily at assembling a useful list of citations on the economics of information, it also revealed some interesting characteristics of the current literature and raised some questions.

The most obvious characteristic of the literature is its extreme diffuseness. As a corollary to that, more material exists than is immediately evident. Although both the economics and the information communities produce material relevant to the topic, little interaction occurs and virtually no cross-referencing is evident between the literatures of these two communities. Two related factors probably account for this diffuseness. The first of these is the "emerging" stage of development of this topic, since the economics of information has only recently been treated as a discrete topic for study by either economists or information specialists. The second factor is the "part of" character of most items treating this topic, in which work pertinent to the economics of information has usually been produced with some other topic or purpose in mind, often without the publication of results as an objective of the work.

This diffuseness also extends to the terminology employed in discussing the economics of information within the literature, including the key terms "economics" and "information." Within the information community, little consensus is evident concerning the use of "economics;" typically, the tendency is to equate economics with any literature in which a dollar sign appears. Conversely, the literature of the economics community uses the term "information" to cover a variety of phenomena, ranging from a narrow view of information as purely price and market data to a very broad interpretation of information as covering practically any communication. Consequently, subject headings relating to the economics of information are used with little consistency or accuracy by abstracting and indexing services, so that the material is widely scattered and often buried in the publications of these services.

Another characteristic of the literature is that it is quite spotty and often fuzzy in content. A general framework in which to place particular studies is lacking. Most work on information activity focuses almost exclusively on the supply side of economic analysis and neglects the demand side. The result is lopsided analysis—much on costs with little on benefits. Typically, such work is descriptive rather than analytic. Even at the descriptive level, the context provided for studies is often insufficient to give any meaning to numerical data on costs, etc. Furthermore, the cost structures employed by such studies have been dominated by the need to establish accountability for preventing misappropriation of funds rather than by the need to improve managerial performance in information activities.

Much of the work by information specialists on the economics of information has dealt with either the evaluation of information systems or the administration of information activity, especially in terms of accounting costs. However, more specific and intense interest about the economics of information has developed recently, apparently stimulated by two issues now facing the information community. One is the impact of technological change and the general uncertainty as to when automation is economically warranted in information activity; an issue also facing managers of many other types of activities. The other issue is the increasing funding squeeze on public sector activity and the increasing demands by sponsors for more rational and quantified justification of information activities; an issue facing most areas of public service today.

In general, economists have done only a modest amount of work focusing directly on information in the sense that this term is used concerning libraries and the publication process. Probably the most relevant work by economists has been as a consequence of commissions stemming from major studies of information activity such as those of the National Academy of Sciences, National Academy of Engineering Committee on Scientific and Technical Communication, and the president's National Advisory Commission on Libraries.

Can any useful lessons be learned from this examination of the literature on the economics of information? One key feature which was revealed is that systematic analysis, as developed by economists, has rarely been used in studying information activities, probably because of the substantial communications gap between economics and information specialists. This communications gap is evident in the lack of flow between the literatures produced by these two communities. In addition, a fundamental lack of consensus concerning what is really important in the discussions of economics of information by both sides is evident; the impression is that the information community is generally lacking in an understanding of economics, while the economists fail to understand information problems.

But in the relatively few studies where these two groups have worked closely together, fruitful payoffs have resulted. Therefore, more thought and effort aimed toward remedying this communications gap seem warranted. It may be further speculated that, to some extent, the field of economics in 1970 resembles that of psychology in 1960 with respect to the potential for advancing the study of information activity. Consider the impact psychologists made during the past decade in their study of information activity, particularly that of user behavior and its policy implications for information program development. Thus, the experience of developing a relationship between the information community and psychology may offer insights useful in pursuing the relationship which exists between economics and the information community today.

Improving this relationship poses some major questions to the information profession, for instance: What steps can be taken to improve the exchange of information between these two communities? How can more integrative research and studies on the economics of information be encouraged? And how can greater capacity for economic analysis of information activity be developed?

Perhaps the most fundamental question concerning the economics of information is: Where should the capability for economic analysis be located? A number of alternatives are possible—the operating staffs of information organizations, agencies sponsoring information research and development, professional associations, information schools training professionals for the information community, or economics or information research organizations. The most likely solution is a mix of the former with capability at several levels. But what mix would be the most effective?

Finally, two suggestions are offered here which are designed to ease the burden in keeping up with the literature. First, improve the organization of material on this topic by abstracting and indexing tools serving this area. Currently, the indexing and classification structures used by such abstracting and indexing services are very weak in their treatment of the subject. In part, this weakness stems from defects in the primary documentation on economics of information. But, in addition, most abstracting and indexing services have not worked out an effective and coherent index language and classification structure for this material. Steps should be taken to remedy these defects, either by the abstracting and indexing services alone or by these services with the aid of interested professional groups.

Second, improve access to unpublished studies and data concerning the economics of information. Apparently a significant number of unpublished studies do exist in this area. Obscure or oblique references to these studies suggest that they may contain useful data for the economic analysis of information activity. But two factors appear to limit access to and use of such unpublished efforts: (1) no one collection point now exists to handle such literature, and (2) the material in such studies appears to be highly sensitive and is often confidential with respect to the source of activity studied. Therefore, some organization or professional group should collect and make accessible the results of such studies, but with adequate guarantees for protection of the confidentiality of the study sources. This could be done by adopting rules for protecting the anonymity of the data sources for these studies, perhaps by adoption of the rules used by the Bureau of the Census in handling business financial data. Furthermore, the alleged existence of these unpublished studies may be symptomatic of defects in the current primary publication process for handling this literature; perhaps material on the economics of information requires some change in the usual documentation practices via primary journals.

In conclusion, the literature concerning the economics of information often stimulates many questions, but does not provide many helpful answers. Perhaps the most significant aspect revealed in this literature search is the weak linkage between the economics community and the information community, suggesting that a major communications gap exists here.

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NOTE: The titles of the categories numbered 1 through 14 are fully described and their pertinence to the economics of information is shown in Table 1. Items marked by an asterisk (*) are particularly informative.

The citations are arranged under various subheadings within the broad categories as an attempt to group related material. This approach is intended to provide economists with an introduction to the field of information science and to enable information scientists to learn more about economics.

Those citations which carry PB or AD numbers may be obtained from the National Technical Information Service, Springfield, Virginia 22151; and those with ED numbers from the ERIC Document Reproduction Service, 4936 Fairmont Avenue, Bethesda, Maryland 20014. PhD dissertations are available from University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan 48106.

1. ECONOMICS: OVERVIEW/THEORY

General

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General

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General

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